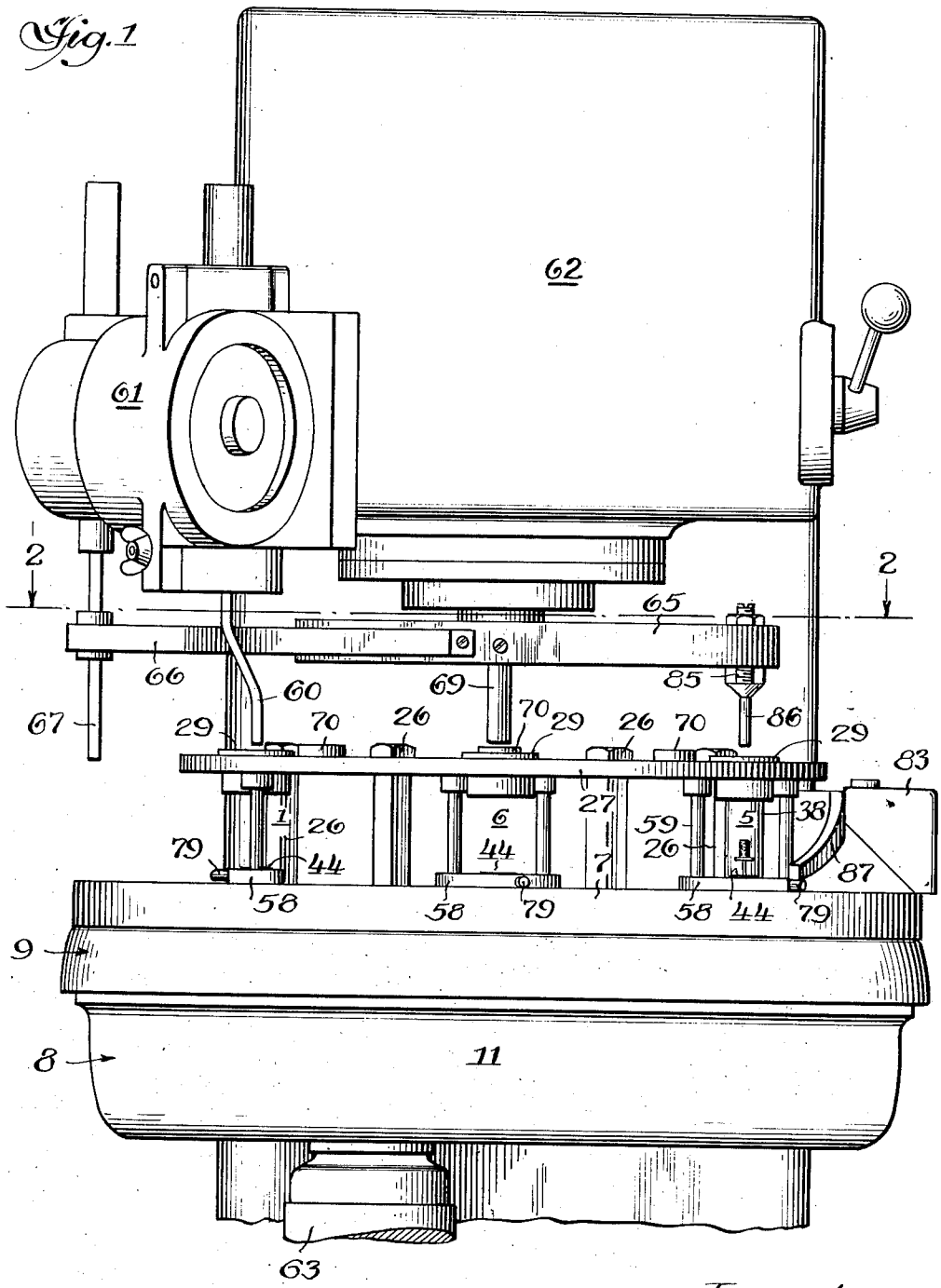
July 9, 1957 J. D. WINTERS 2,798,255

POWDER PRESSING MACHINE

Filed Feb. 8, 1954 7 Sheets-Sheet 1

Fig. 1



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POWDER PRESSING MACHINE

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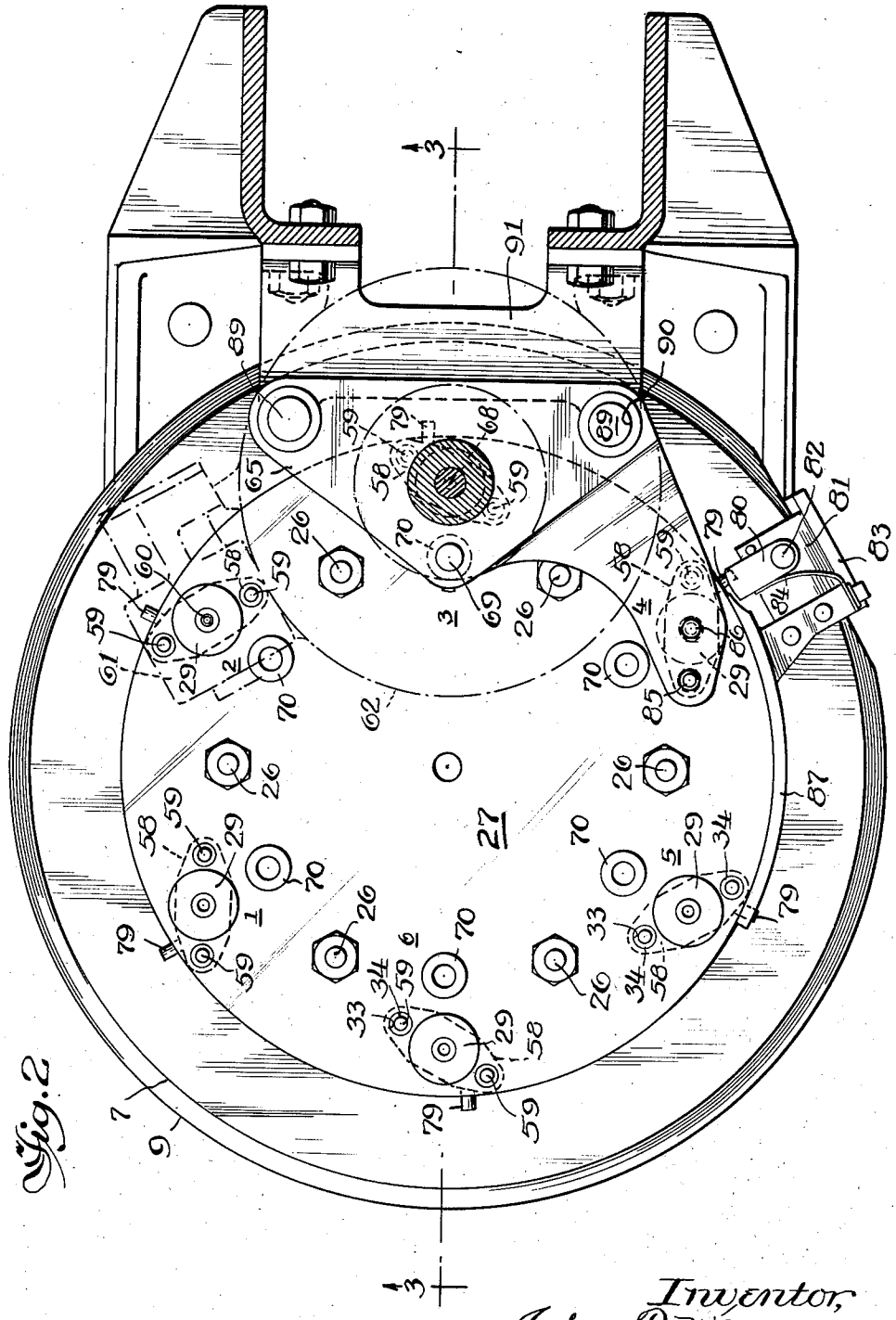


Fig. 2

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POWDER PRESSING MACHINE

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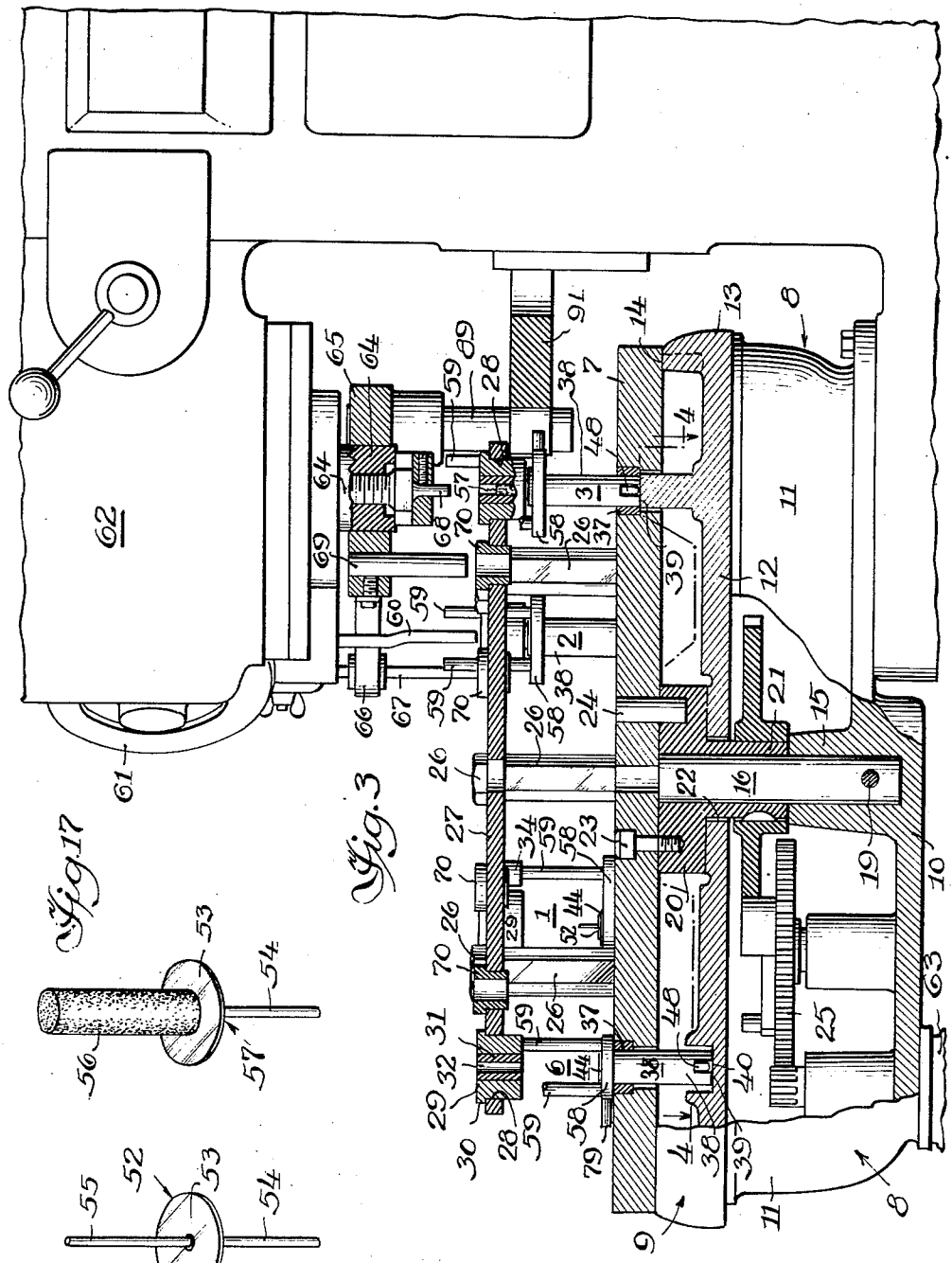


Fig. 3

Fig. 17

Fig. 16

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POWDER PRESSING MACHINE

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Fig. 6

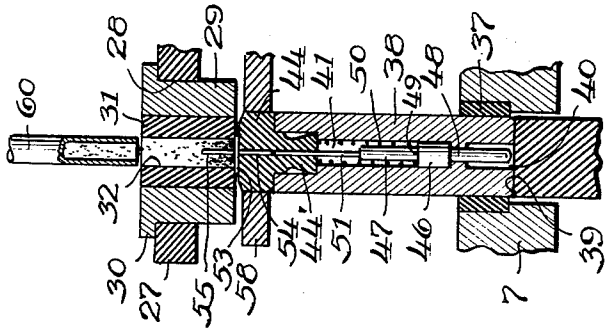


Fig. 4

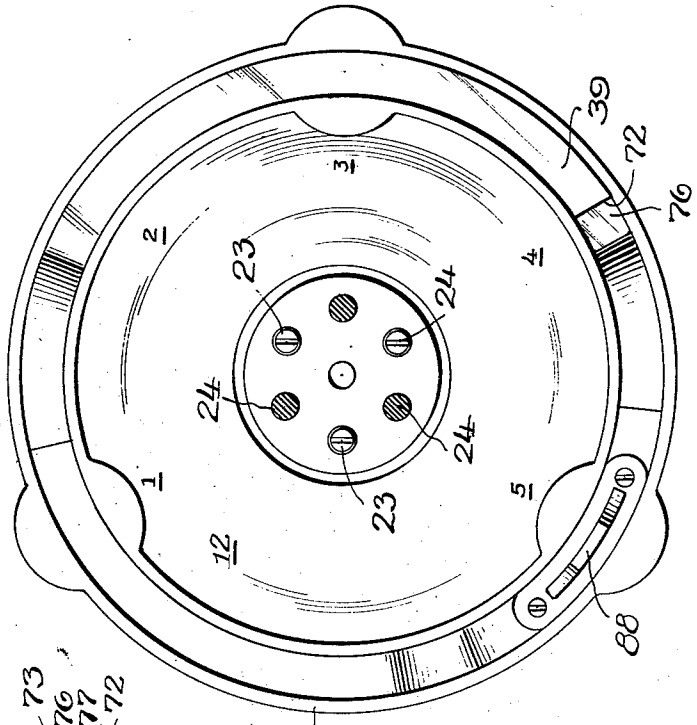
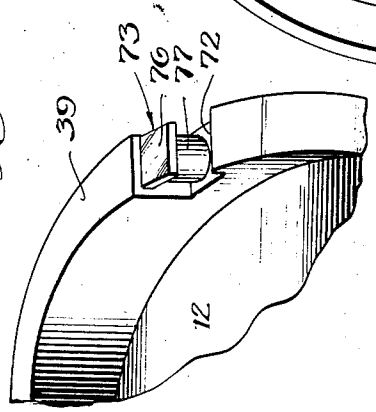


Fig. 11



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POWDER PRESSING MACHINE

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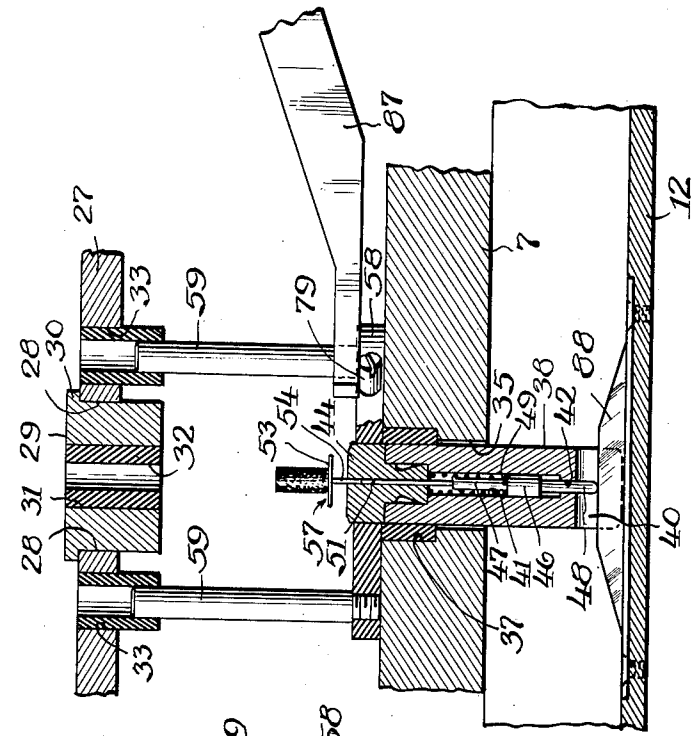


Fig. 15

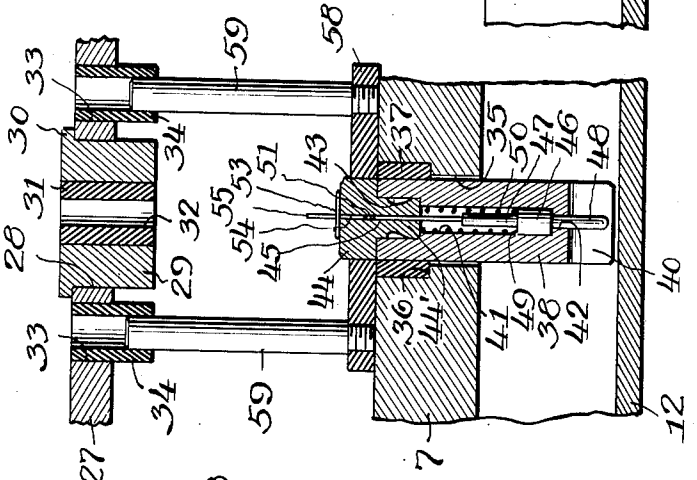


Fig. 5

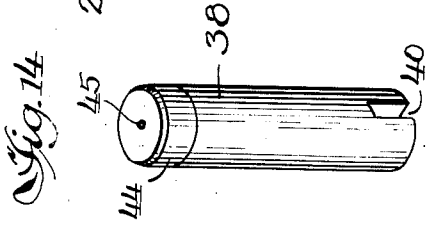


Fig. 14

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POWDER PRESSING MACHINE

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Fig. 8

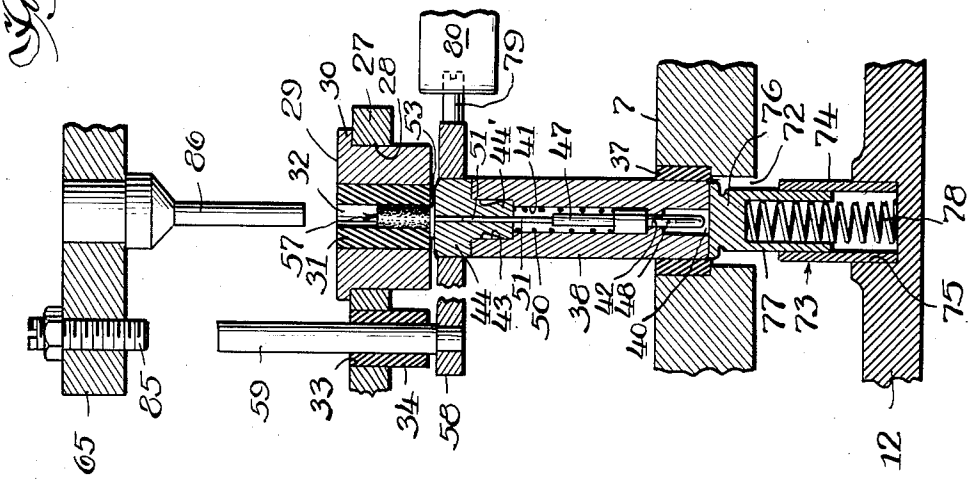
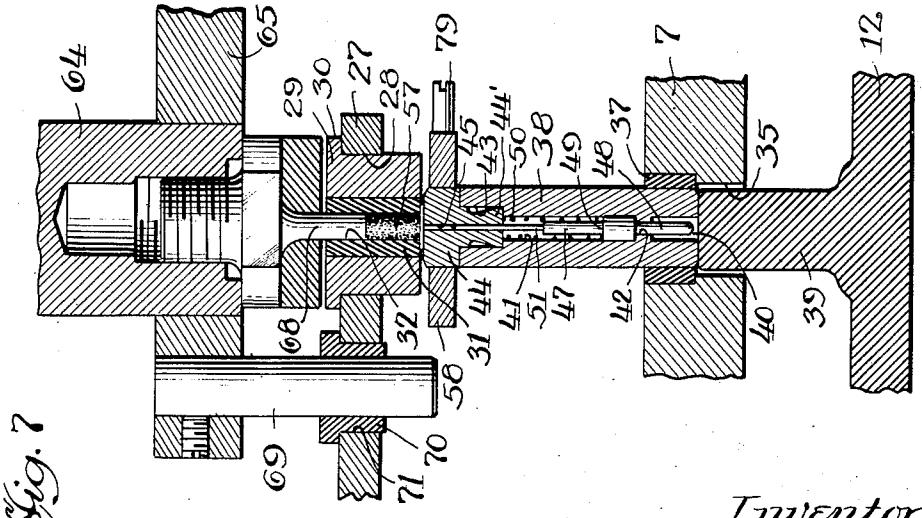


Fig. 7



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POWDER PRESSING MACHINE

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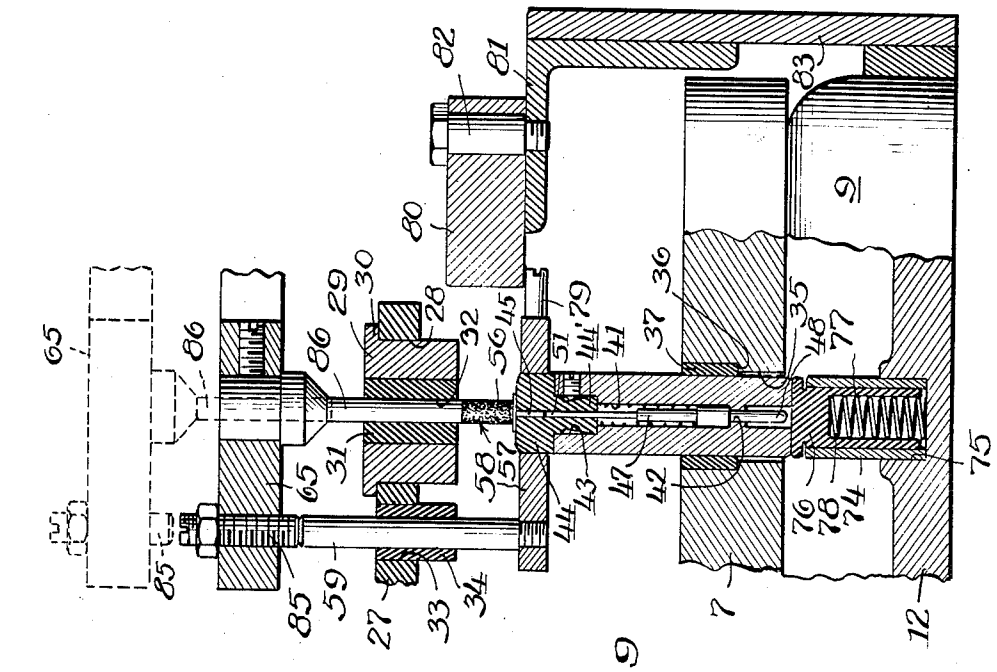


Fig. 9

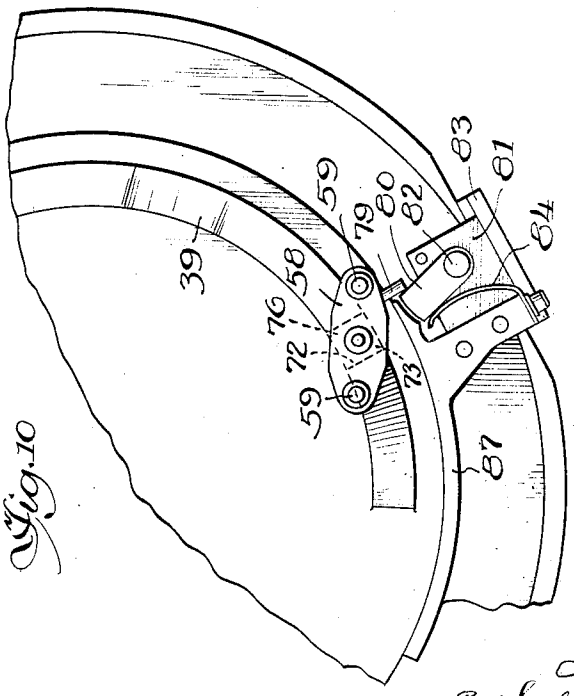


Fig. 10

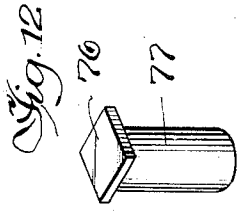


Fig. 12

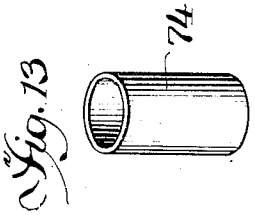


Fig. 13

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United States Patent Office 2,798,255 Patented July 9, 1957

2,798,255

POWDER PRESSING MACHINE

John D. Winters, Lake Bluff, Ill., assignor to Fansteel Metallurgical Corporation, a corporation of New York

Application February 8, 1954, Serial No. 408,662

16 Claims. (Cl. 18—20)

This invention relates to a machine for compacting powder, and particularly for compacting tantalum metal powder to a predetermined porous condtion.

Although the description of the invention will be limited, for the sake of convenience, to the production of a compacted tantalum electrode for subsequent use in a capacitor, it will be understood that the machine may be utilized to compact any powdered material to accurate pressures.

The machine constructed in accordance with the present invention is designed to compact metal powder around a capacitor element with predetermined pressure, so that after the compacted mass is sintered it will have uniform porosity throughout.

The process of compacting the tantalum metal powder comprises a sequence of different operations, and the machine is provided with a turntable indexed to stop at a plurality of different work stations at each of which one step of the process is accomplished, with the result that a different capacitor element is positioned at each work station every time the turntable stops, and each capacitor element is completely processed when it has traveled one complete cycle of the turntable. One capacitor element is fed into the machine at the first work station and one is discharged at the last work station every time the turntable stops, so that the process is continuous.

A smal amount of binder is preferably added to the metal powder to increase the adhesion when the powder is compacted to self-sustaining form. The compact is very frangible, and therefore the capacitor element is lifted partially out of the die at the discharge station so that it may be removed by tweezers which are applied to a pin on one side of the capacitor element. This pin does not have any powder compacted thereagainst, and therefore may be handled without breakage. The compacted capacitor elements are inserted into a suitable holder in which they are sintered. The sintering process unites the compacted tantalum powder permanently with the capacitor element, which is made entirely of tantalum, and also causes the binder to volatilize so that the capacitance of the final product is not adversely affected by the presence of any binder.

The structure by means of which the above and other advantages of the invention are attained will be described in detail in the following specification, taken in conjunction with the accompanying drawings, showing a preferred embodiment of the invention, in which:

Figure 1 is a front elevation of a machine embodying the invention;

Figure 2 is a cross-sectional view, taken along the line 2—2 of Figure 1;

Figure 3 is a vertical sectional view, taken along the line 3—3 of Figure 2;

Figure 4 is a cross-sectional view, taken along the line 4—4 of Figure 3;

Figure 5 is a fragmentary vertical sectional view through the first work station of the machine at which

the tantalum pin to be compacted is first loaded into the machine;

Figure 6 is a fragmentary vertical sectional view through the second station in which the powder to be compacted is loaded in the die;

Figure 7 is a fragmentary vertical sectional view through the third station at which the powder is compacted;

Figure 8 is a fragmentary vertical view through the fourth station at which the pressing punch is retracted from the die, with the parts in position just prior to the stripping operation;

Figure 9 is a view similar to Figure 8, with the parts in position just subsequent to the stripping operation;

Figure 10 is a fragmentary top plan view of the fourth station and contiguous sections of the turntable;

Figure 11 is a fragmentary perspective view of one section of the turntable having a spring pressed plunger to hold the supporting post at the fourth station to facilitate stripping the compacted capacitor element from the die;

Figure 12 is a detail perspective view of the spring pressed plunger described in Figure 11;

Figure 13 is a detail perspective view of the tubular sheath in which the spring pressed plunger is housed;

Figure 14 is a detail prespective view of the supporting post for holding the capacitor element as it is moved through the various work stations of the machine;

Figure 15 is a fragmentary vertical section through the fifth station, at which the compacted capacitor element is removed from the machine;

Figure 16 is a detail perspective view of the capacitor element at the start of the operations; and

Figure 17 is a detail perspective view of the capacitor element after the tantalum powder has been compacted about the pin on one side.

Referring to the drawings, the various work stations of the machine are designated by the numerals 1 to 5. The station indicated at 6 is idle and may be disregarded. The sixth station is provided only because some parts for a six-station machine may be purchased as stock items in the open market, while every part would have to be made to order for a five-station machine. The stations are mounted on a turntable 7 and are equally spaced in a circular formation, as shown in Figure 2.

The machine is provided with a two-part base, indicated at 8 and 9 in Figure 3. Base member 8 has a bottom wall 10 and an upstanding side wall 11 which supports the base member 9. The base member 9 also has a bottom wall 12 and an upstanding side wall 13 which terminates in a horizontally disposed flange 14. Base 8 is provided with an upstanding socket 15 in which a center post 16 is seated. The post 16 is rigidly secured to socket 15 by a bolt or stud 19. A hub 20 fits around post 16 and is provided with a depending shank 21 which extends through an opening 22 in the bottom wall 12 of base member 9 and is supported by the upper edge of socket 15. The turntable 7 is rigidly secured to the hub 20 by means of a plurality of bolts 23 and dowel pins 24. The outer peripheral edge of turntable 7 is supported by flange 14 of base member 9.

A Geneva movement 25, mounted in base member 8, is operatively connected to hub 20 and rotates the turntable along with the hub. The Geneva movement is indexed to provide six equally spaced rests of uniform length so that as the turntable is rotated through one complete revolution it is stopped at six equally spaced intervals for uniform rests. The Geneva movement is arranged so that one of the work pieces, hereinafter described, is located at each of the work stations every time the turntable is at rest. The Geneva movement

and the mechanism for actuating it are conventional and therefore will not be described.

A plurality of supporting posts **26** extending upwardly from turntable **7** support a plate **27** in parallel spaced relationship to the turntable. Posts **26** are rigidly secured to turntable **7** and to plate **27** so that the plate moves with the turntable. Plate **27** is provided with six openings **28** equally spaced circumferentially of the plate. An upper die member **29** is drive-fitted into each opening **28** and is provided with a shoulder **30** overlying the edge of plate **27**, as shown in Figure 5. Each die member **29** has a hardened insert **31** provided with a vertical bore **32**. The plate **27** is also provided with a pair of openings **33** on diametrically opposite sides of each opening **28**. A sleeve **34** is drive-fitted into each of the openings **33** and depends a short distance below the lower surface of the plate **27**.

The turntable **7** is provided with six openings **35**, each aligned axially with one of the openings **28** in plate **27**. The upper portion of each opening is counterbored, as indicated at **36**, and a bushing **37** is seated in the counterbored portion of each opening. A supporting post **38** is slidably mounted in each bushing. The bottom end of each supporting post is positioned on a cam track **39** (Figs. 3 and 4) integral with the bottom wall **12** of base member **9**, and is provided with a transverse recess **40**. The cam track is at its lowermost level at the first station and ascends to its high level before it reaches station **2**. The cam track remains at its high level around the circumference of the bottom wall **12** until it reaches station **4**. The cam slopes downwardly past station **4** and reaches its lowermost level again at station **5**. The cam remains at its low level until after it passes station **1**.

As shown in Figure 5, each supporting post has a longitudinal bore **41** having its lower end **42** of reduced diameter and its upper end **43** of increased diameter. A hardened insert **44** has a shank **44'** drive-fitted into the upper end **43** of bore **41**. The insert **44** has a narrow vertical bore **45** extending therethrough. An ejecting pin **46** fits slidably into bore **41** and has upper and lower portions, **47** and **48** respectively, of reduced thickness. The upper portion **47** forms a shoulder **49** on pin **46**, and the lower portion **48** passes through the lower end **42** of bore **41** and into the recess **40**. A coiled compression spring **50** is positioned in bore **41** and bears against shoulder **49** and the bottom of shank **44'** of insert **44**. Since shank **44'** is drive-fitted into the bore and the pin **46** is slidable therein, spring **50** urges pin **46** downwardly so that it normally stays in its lowermost position. A thin pin **51** extends upwardly from the top of portion **47** of pin **46** into vertical bore **45** in which it is slidable. Pin **51** may be integral with pin **46** or may be a separate member. The upper end of pin **51** extends approximately half way through bore **45** when pin **46** is in its lowermost position.

The machine is so designed that when turntable **7** is at rest, one of the supporting posts **38** is located at each of the stations. During the rest interval the operator inserts a capacitor element **52** (Fig. 16) in the supporting post **38** at position **1** (Fig. 5). Each capacitor element comprises a flange or disk **53** having identical pins **54** and **55** welded to opposite sides thereof. Pins **54** and **55** are located centrally of the flange and are in axial alignment. The flange and both pins are made of tantalum or other suitable refractory material. The machine compacts a quantity of powder around pin **55**, as indicated at **56** (Fig. 17) and the capacitor element in its final form is designated by the reference numeral **57**. The pin **54** is inserted in bore **45**, and flange **53** rests on the top surface of insert **44**. The lower end of pin **54** terminates a short distance above the upper end of pin **51**.

A collar **58** is rigidly secured to insert **44** and extends laterally therefrom. Collar **58** is shown as being of substantially oval shape, but it is obvious that it may be of any shape. A pair of guide pins **59** are secured to opposite end portions of collar **58** and extend upwardly into sleeves **34** in which they are slidably fitted. The guide pins hold the supporting posts to true vertical position as the supporting posts move vertically in response to variations in height of cam track **39** which engage the bottom of each supporting post as turntable **7** rotates to carry each supporting post past the work stations. For the sake of clarity, the movement of a single supporting post will be described through a complete revolution of the turntable.

The supporting post **38**, with capacitor element **52** positioned thereon, is moved from station **1** to station **2**, shown in Figure 6. The cam ascends from its lowermost level at station **1** to its uppermost level at station **2** so that the bottom of supporting post **38** is approximately flush with the lower edge of bushing **37** and the upper surface of flange **53** abuts the underside of upper die insert **31** with pin **55** projecting into bore **32**. A this station, bore **32** is filled with a measured quantity of powder from a tube **60** extending from a powder dispenser **61** (Fig. 1). The preferred powder dispenser is disclosed and claimed in the application Serial No. 395,891 filed December 3, 1953, in the names of John D. Winters and Arthur C. Nichols, but any suitable dispenser may be used.

The powder dispenser is supported by the housing **62** of a motor (not shown) which is synchronized with the motor **63** operating Geneva movement **25** so that a ram **64** (Figs. 3 and 7) is reciprocated vertically once every time turntable **7** is at rest, the ram starting its downward stroke immediately after turntable **7** stops rotating. A crosshead **65** is rigidly secured to ram **64** and reciprocates therewith. A strap **66** secured to crosshead **65** and extending laterally therefrom is secured to an actuating rod **67** depending from powder dispenser **61**. A predetermined quantity of powder is spilled into tube **60** upon each downward stroke of the ram.

At station **3** (Fig. 7) supporting post **38** is aligned with ram **64**. A press pin **68**, secured in the bottom of ram **64** enters bore **32** and compacts the powder on its downward stroke. At this station an index pin **69**, depending from crosshead **65**, moves into a bushing **70** fitted in an aperture **71** in plate **27** upon the downward movement of the ram and crosshead. As shown in Figure 2, turntable **7** is provided with a bushing **70** for each station so that one of them is aligned with the index pin every time the turntable stops. The engagement of the index pin with bushing **70** insures accurate alignment of each supporting post **38** with the mechanism adapted to perform various steps in the process of compacting the powder at each work station. The vertical alignment of index pin **69** is maintained by a pair of guide rods **89** which depend from crosshead **65** into aperture **90** provided therefor in a bracket **91** rigidly secured to the frame of the machine, as indicated in Figures 2 and 3.

Cam **39**, upon which the bottom of supporting post **38** rides, is provided with a recess or gap **72** (Fig. 11) in which a vertically movable spring loaded plunger **73** is positioned. As shown in Figures 8, 12 and 13, plunger **73** comprises a tubular sleeve **74** fitting in a suitable aperture **75** in bottom wall **12** of base member **9**, a plunger head **76** and a tubular sleeve **77** depending from head **76** into sleeve **74**. A coiled compressed spring **78** is confined within the tubular portion of the plunger with end bearing against bottom wall **12** and its other end bearing against the undersurface of plunger head **76** to urge the plunger upwardly.

At station **4** the bottom of supporting post **38** rests on plunger head **76**. As rotation of turntable **7** brings post **38** close to station **4**, a latching pin **79**, extending laterally from collar **58**, strikes the side of latch **80** pivoted to a bracket **81**, as indicated at **82**, Figure 9. Bracket **81** is supported by a strip **83** extending upwardly from base

member 9. Pin 79 moves latch 80 pivotally a short distance before the turntable stops rotating. A flat spring 84 (Fig. 10) bears against the opposite side of latch 80 to resist its pivotal movement. As soon as turntable 7 stops rotating, a stud 85, depending from crosshead 65, engages the top of guide pin 59 (Fig. 9) to move collar 58 and post 38 downwardly against the action of spring 78. At the same time a stripper pin 86, also depending from crosshead 65, enters bore 32 to strip the compacted end 56 of the capacitor element from upper die member 29. As pin 79 is moved below the bottom of latch 80, the spring 84 moves the latch back to its normal position where it overlies pin 79 to prevent upward movement of post 38 under the influence of spring 78 when the upward stroke of crosshead 65 moves stud 85 out of engagement with guide pin 59.

As shown in Figure 11, cam 39 is decreased in height past the gap 72. As turntable 7 rotates to move supporting post 38 towards station 5, the pin 79 engages the underside of an arcuate cam 87 (Fig. 15) which forces the collar 58 downwardly towards the turnable. Collar 58 reaches its lowermost position, in which it engages the top of the turntable, immediately before it reaches station 5. A narrow cam 88 extending upwardly from bottom wall 12 at station 5 engages pin 48 to partially lift capacitor element 57 from insert 44 at station 5. An operator engages the capacitor element with tweezers or some similar instrument at this point, to remove it from the machine and place it in a suitable holder in which it is transferred to a sintering furnace.

Although I have described a preferred embodiment of my invention in considerable detail, it will be understood that the description thereof is intended to be illustrative, rather than restrictive, as many details may be modified or changed without departing from the spirit or scope of the invention. Accordingly, I do not desire to be restricted to the exact details of construction described.

What is claimed is:

1. In a machine for compacting metal powder against an article, a turntable indexed to rotate intermittently with rests of uniform duration at each of a plurality of uniformly spaced work stations, a plurality of supporting posts mounted on said turntable in the same spaced relationship as said stations, one of said posts being positioned at each of said stations each time said turntable comes to rest, each of said posts having an axial bore engageable with one portion of the article against which powder is to be compacted to hold said article in predetermined position for said compacting operation, a cam engaging the bottom of each of said posts, said cam having a high level and a low level to regulate the vertical position of said posts at each of said stations, said cam having a gap at one of said stations adjacent one end of the high level of said cam, a spring loaded plunger positioned in said gap, said plunger having a head normally held substantially flush with the adjacent high level portion of said cam, said plunger head engaging the bottom of the supporting post positioned at said one station when said turntable is at rest, means to depress said one supporting post against the action of said spring loaded plunger, a pin projecting laterally from said supporting post, a latch engageable with said laterally projecting pin when said supporting post is depressed to prevent upward movement of said supporting post to said high level upon release of said depressing means, and a second cam positioned adjacent said first cam and extending from a position adjacent the opposite side of said gap to a position adjacent the next station, said second cam being engageable with said pin upon rotation of said turntable to force said supporting post downwardly to its lower level as said post moves to said next station.

2. In a machine for compacting metal powder against an article, a turntable indexed to rotate intermittently with rests at each of a plurality of spaced work stations, a plurality of supporting posts mounted on said turntable in the same spaced relationship as said stations, one of said posts being positioned at each of said stations each time said turntable comes to rest, each of said posts having an axial bore engageable with one portion of the article against which powder is to be compacted to hold said article in predetermined position for said compacting operation, a cam engaging the bottom of each of said posts, said cam having a high level and a low level to regulate the vertical position of said posts at each of said stations, said cam having a gap at one of said stations adjacent one end of the high level of said cam, a spring loaded plunger positioned in said gap, said plunger having a head normally held substantially flush with the adjacent high level portion of said cam, said plunger head engaging the bottom of the supporting post positioned at said one station when said turntable is at rest, means to depress said one supporting post against the action of said spring loaded plunger, a pin projecting laterally from said supporting post, a latch engageable with said laterally projecting pin when said supporting post is depressed to prevent upward movement of said supporting post to said high level upon release of said depressing means, and a second cam positioned adjacent said first cam and extending from a position adjacent the opposite side of said gap to a position adjacent the next station, said second cam being engageable with said pin upon rotation of said turntable to force said supporting post downwardly to its lower level as said post moves to said next station.

3. In a machine for compacting metal powder against an article, a turntable indexed to rotate intermittently with rests of uniform duration at each of a plurality of uniformly spaced work stations, a plurality of supporting posts mounted on said turntable in the same spaced relationship as said stations, one of said posts being positioned at each of said stations each time said turntable comes to rest, each of said posts having an axial bore engageable with one portion of the article against which powder is to be compacted to hold said article in predetermined position for said compacting operation, a cam engaging the bottom of each of said posts, said cam having a high level and a low level to regulate the vertical position of said posts at each of said stations, said cam having a gap at one of said stations adjacent one end of the high level of said cam, a spring loaded plunger positioned in said gap, said plunger having a head normally held substantially flush with the adjacent high level portion of said cam, said plunger head engaging the bottom of the supporting post positioned at said one station when said turntable is at rest, means to depress said one supporting post against the action of said spring loaded plunger, means to hold said supporting post against upward movement to said high level upon release of said depressing means, and means engageable with said post to force it downwardly to said low level as it is moved to said next station.

4. In a machine for compacting metal powder against an article, a turntable indexed to rotate intermittently with rests of uniform duration at each of a plurality of uniformly spaced work stations, a plurality of posts mounted on said turntable in the same spaced relationship as said stations, one of said posts being positioned at each of said stations each time said turntable comes to rest, each of said posts having means supporting said article in predetermined position for said compacting operation, a cam engaging the bottom of each of said posts, said cam having a high level and a low level to regulate the vertical position of each of said posts at said stations, said cam having a gap at one of said stations adjacent one end of the high level of said cam, a spring loaded plunger positioned in said gap, said plunger having a head normally held substantially flush with the adjacent high level portion of said cam, said plunger head engaging the bottom of the post positioned at said one station when said turntable is at rest, a pivot-

ally movable latch positioned adjacent said plunger, a spring normally holding said latch in predetermined position, a pin projecting laterally from said post, said pin engageable with said latch to move it pivotally in a horizontal plane against the action of said spring as said post approaches said one station, and means to depress said one post against the action of said spring loaded plunger, said spring moving said latch back to said predetermined position in which it overlies said pin as said one post is depressed to move said pin below the level of said latch.

5. In a machine for compacting metal powder against an article, a turntable indexed to rotate intermittently with rests of uniform duration at each of a plurality of uniformly spaced work stations, a plurality of posts mounted on said turntable in the same spaced relationship as said stations, one of said posts being positioned at each of said stations each time said turntable comes to rest, each of said posts having means supporting said article in predetermined position for said compacting operation, a cam engaging the bottom of each of said posts, said cam having a high level and a low level to regulate the vertical position of each of said posts at each of said stations, said cam having a gap at one of said stations adjacent one end of the high level of said cam, a spring loaded plunger positioned in said gap, said plunger having a head normally held substantially flush with the adjacent high level portion of said cam, said plunger head engaging the bottom of the post positioned at said one station when said turntable is at rest, a pivotally movable latch positioned adjacent said plunger, a spring normally holding said latch in predetermined position, a pin projecting laterally from said post, said pin engageable with said latch to move it pivotally in a horizontal plane against the action of said spring as said post approaches said one station, means to depress said one post against the action of said spring loaded plunger, said spring moving said latch back to said predetermined position in which it overlies said pin as said one post is depressed to move said pin below the level of said latch, and means engaging said pin to force said supporting post downwardly to said low level as said supporting post is moved to said next station.

6. In a machine for compacting metal powder against an article, a turntable indexed to rotate intermittently with rests of uniform duration at each of a plurality of uniformly spaced work stations, a plurality of supporting posts mounted on said turntable in the same spaced relationship as said stations, one of said posts being positioned at each of said stations each time said turntable comes to rest, each of said posts having an axial bore engageable with one portion of the article against which powder is to be compacted to hold said article in predetermined position for said compacting operation, a cam engaging the bottom of each of said posts, said cam having a high level and a low level to regulate the vertical position of each of said posts at each of said stations, said cam having a gap at one of said stations adjacent one end of the high level of said cam, a spring loaded plunger positioned in said gap, said plunger having a head normally held substantially flush with the adjacent high level portion of said cam, said plunger head engaging the bottom of the supporting post positioned at said one station when said turntable is at rest, a pivotally movable latch positioned adjacent said plunger, a spring normally holding said latch in predetermined position, a pin projecting laterally from said supporting post, said pin engageable with said latch to move it pivotally in a horizontal plane against the action of said spring as said supporting post approaches said one station, means to depress said one supporting post against the action of said spring loaded plunger, said spring moving said latch back to said predetermined position in which it overlies said pin as said one supporting post is depressed to move said pin below the level of said latch, and a second cam positioned adjacent said first cam and extending from a position adjacent the opposite side of said gap to a position adjacent the next station, said second cam being engageable with said pin upon rotation of said turntable to force said supporting post downwardly to its lower level as said post moves to said next station.

7. In a machine for compacting metal powder against an article, a turntable indexed to rotate intermittently with rests of uniform duration at each of a plurality of uniformly spaced work stations, a plurality of supporting posts mounted on said turntable in the same spaced relationship as said stations, one of said posts being positioned at each of said stations each time said turntable comes to rest, each of said posts having an axial bore engageable with one portion of the article against which powder is to be compacted to hold said article in predetermined position for said compacting operation, a cam engaging the bottom of each of said posts, said cam having a high level and a low level to regulate the vertical position of each of said posts at each of said stations, said cam having a gap at one of said stations adjacent one end of the high level of said cam, a spring loaded plunger positioned in said gap, said plunger having a head normally held substantially flush with the adjacent high level portion of said cam, said plunger head engaging the bottom of the supporting post positioned at said one station when said turntable is at rest, a vertically reciprocable ram, means for reciprocating said ram once at each rest of said turntable, a crosshead rigidly secured to said ram, a stud depending from said crosshead, a collar rigidly secured to and extending laterally from each of said supporting posts, a pin extending laterally from each of said collars, a guide pin extending upwardly from each of said collars, said guide pin on the collar of said one supporting post being aligned vertically with said stud, whereby said stud depresses said one supporting post upon the downward stroke of said ram, a latch engageable with said laterally projecting pin when said supporting post is depressed to prevent upward movement of said supporting post to said high level upon release of said depressing means, and a second cam positioned adjacent said first cam and extending from a position adjacent the opposite side of said gap to a position adjacent the next station, said second cam being engageable with said pin upon rotation of said turntable to force said supporting post downwardly to its lower level as said post moves to said next station.

8. In a machine for compacting metal powder against an article, a turntable indexed to rotate intermittently with rests of uniform duration at each of a plurality of uniformly spaced work stations, a plurality of supporting posts mounted on said turntable in the same spaced relationship as said stations, one of said posts being positioned at each of said stations each time said turntable comes to rest, each of said posts having an axial bore engageable with one portion of the article against which powder is to be compacted to hold said article in predetermined position for said compacting operation, a cam engaging the bottom of each of said posts, said cam having a low level at the first of said work stations, ascending to a high level at the second of said work stations, maintaining said high level until the fourth work station, and descending to said low level at the fifth of said work stations, said cam having a gap at said fourth work station, a spring pressed plunger positioned in said gap, said plunger being normally substantially flush with the high level of said cam, means to depress the supporting post positioned on said plunger, latch means to hold said last mentioned supporting post against upward movement

to said high level upon release of said depressing means, and means to hold said last mentioned supporting post in engagement with the descending portion of said cam as said turntable rotates it to said fifth work station.

9. In a machine for compacting metal powder, a supporting post for supporting an article against which said powder is to be compacted, an upper die having a bore into which the portion of said article against which the powder is to be compacted is positioned, means for positioning a predetermined amount of metal powder in said bore, means for compacting said powder, a collar extending laterally from said supporting post, a guide pin extending upwardly from said collar, a crosshead reciprocable vertically, a stripper pin and a stud projecting downwardly from said crosshead, said stud being aligned axially with said guide pin, and said striper pin being aligned axially with said bore, whereby downward movement of said crosshead moves said supporting post and said compacted powder downwardly to strip said compacted powder from the bore of said upper die.

10. In a machine having a plurality of work stations for simultaneously performing different steps of a process for compacting metal powder, a supporting post for supporting an article against which said powder is to be compacted, an upper die having a vertical bore into which the portion of said article against which the powder is to be compacted is positioned, means for positioning a predetermined amount of metal powder in said bore, means for compacting said powder, a collar extending laterally from said supporting post, a latch pin extending laterally from said collar, a guide pin extending upwardly from said collar, a crosshead reciprocable vertically, a stripper pin and a stud projecting downwardly from said crosshead, said stud being aligned axially with said guide pin, and said stripper pin being aligned axially with said bore, whereby downward movement of said crosshead moves said supporting post and said compacted powder downwardly to strip said compacted powder from the bore of said upper die, and a latch engageable with said latch pin when said supporting post is moved downwardly to hold said supporting post from return upward movement when said crosshead moves upwardly.

11. In a machine for compacting metal powder, a die having a vertical bore, a supporting post carrying a capacitor element having a portion positioned in said bore, means for positioning a predetermined quantity of powder in said bore, a turntable carrying said supporting post to a work station, a press pin aligned with said bore at said work station, a crosshead supporting said press pin, means to move said crosshead downwardly, whereby said press pin compacts said powder around the portion of said capacitor within said bore, a latch pin projecting at right angles to said supporting post, said turntable being operable to move said supporting post to another work station, a latch normally aligned horizontally with said latch pin, spring means urging said latch into a position forwardly of said last mentioned station, said latch pin engaging said latch and moving it laterally against the action of said spring means as said supporting post is moved to said last mentioned station, and means at said last mentioned station to depress said supporting post to strip said powder compact from said bore, said spring means being effective to move said latch into vertical engagement with said latch pin to hold said supporting post in depressed position.

12. In a machine for compacting metal powder against an article, a post for supporting said article, a pin slidably mounted in said post, the upper end of said pin engaging the lower end of said article supported on said post, a cam engageable with the lower end of said pin to partially eject said article from said post, means for carrying said post into vertical alignment with said cam, a latch-pin pin projecting laterally from said post, and another cam engaging said latching pin to move said post vertically into engagement with said first cam and moving said pin in the opposing direction.

13. In a machine for compacting metal powder against an article, a turntable rotatable in a horizontal plane, a plate supported in vertically spaced relationship to said turntable and rotatable therewith, an upper die member mounted in said plate, a pair of sleeves mounted in said plate adjacent opposite sides of said upper die, a post slidable vertically in said turntable, said post supporting said article with a portion thereof positioned in said upper die, a collar secured to said post, a pair of guide pins extending upwardly from said collar into said sleeves, means for moving said post downwardly to strip said article from said upper die when said turntable is at rest, an ejecting pin slidably mounted in said post, the upper end of said ejecting pin engaging the lower end of said article supported on the post, a cam engageable with said ejecting pin to partially eject said article from said post, said turntable being operable to carry said post into vertical alignment with said cam, a latching pin projecting laterally from said collar, and another cam engaging said latching pin to move said post vertically into engagement with said first cam and moving said pin in the opposing direction as said post is moved from said stripping position by rotation of said turntable.

14. In a machine for compacting metal powder against an article, a turntable rotatable in a horizontal plane, a post slidable vertically in said turntable, said post supporting said article, a pin slidably mounted in said post, the upper end of said pin engaging the lower end of said article supported on the post, a cam engageable with said pin to partially eject said article from said post, said turntable being operable to carry said post into vertical alignment with said cam, a latching pin projecting laterally from said post, and another cam engaging said latching pin and moving said post vertically into engagement with said first cam as said post is moved by rotation of said turntable.

15. In a machine for compacting metal powder against an article, a turntable provided with a plurality of equally spaced openings arranged circumferentially of said turntable, a post vertically slidable in each of said openings, a cam below said openings engaging the bottom of each of said posts to support said posts at either of two vertical levels, said turntable being rotatable to move said posts in a circular path, means to rotate said turntable with uniform rests at equally spaced stations, means projecting laterally from said post, means at one of said stations for depressing said post from its higher level, a latch engaging said laterally projecting means to prevent return of said post to its higher level upon release of said depressing means, and another cam engaging said laterally projecting means to move said post to its lower level on the first cam as said turntable moves it to the next succeeding station.

16. In a machine for compacting metal powder against an article, a turntable indexed to rotate intermittently with rests at each of a plurality of spaced work stations, a plurality of supporting posts mounted on said turntable in the same spaced relationship as said stations, one of said posts being positioned at each of said stations each time said turntable comes to rest, each of said posts having means supporting said article in predetermined position for compacting operation, a cam engaging the bottom of each of said posts, said cam having a high level and a low level to regulate the vertical position of each of said posts at each of said stations, said cam having a gap at one of said stations adjacent one end of the high level of said cam, a spring pressed plunger positioned in said gap, said plunger being normally substantially flush with the adjacent high level portions of said cam and engaging the bottom of the supporting post positioned at said one

station when said turntable is at rest, means to depress said one supporting post against the action of said spring pressed plunger, means to hold said supporting post against upward movement to said high level upon release of said depressing means, and means engageable with said one post to force it downwardly to said low level as it is moved to said next station.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

ıtent No. 2,798,255 July 9, 1957

John D. Winters

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 17, for "condtion" read --condition--; column 4, line 20, for "A" read --At--; line 66, after "with" insert --one--; column 5, line 21, for "turnable" read --turntable--; column 9, line 16, for "striper" read --stripper--; lines 73 and 74, for "latchpin" read --latching--.

Signed and sealed this 24th day of September 1957.

(SEAL)
Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents